

1. A modular suspension system adapted to a terminal tractor having a frame, comprises:

a lift arm assembly having a rear segment and a front segment pivotally attached to a fifth wheel plate;

and

a trailing arm assembly having a front segment and a rear segment attaching to a rear axle, said front

segment pivotally connecting to said frame of said terminal tractor at two pivot bushing socket tubes

housing elastomeric trailing arm pivot bushings which rotate on a common axis, said elastomeric

trailing arm bushings holding an enforced longitudinal position of said trailing arm assembly while

allowing limited vertical movement and side-to-side rotation of said trailing arm assembly relative

to said frame, wherein said front segment of said hydraulic lift arm assembly is joined to said trailing

arm assembly by two large diameter composite bushings rotating on said outer surface of said pivot

bushing socket of said elastomeric trailing arm pivot bushings, said elastomeric trailing arm pivot

bushings isolating said trailing arm assembly and said lift arm assembly from said frame, with at least

one lift cylinder forcing said lift arm assembly from said trailing arm assembly to forcibly elevate and

lower said lift arm assembly and said fifth wheel plate.

2. The modular suspension system, as disclosed in Claim 1, wherein said trailing arm assembly further comprises:

a rear portion supporting two end housings behind said rear axle securing two ends of a spring means, said spring means having a center, said spring means further stabilizing side to side location of said rear axle and said lift arm assembly and providing controlled vertical and side to side rotational movement, with said spring means adjusted to a preferred ride character.

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3. The modular suspension system, as disclosed in Claim 1, wherein said trailing arm assembly further comprises:

a rear portion supporting two end housings behind said rear axle securing two ends of a transverse leaf spring, said transverse leaf spring having a center, said transverse leaf spring further stabilizing side to side location of said rear axle and said lift arm assembly and providing controlled vertical and side to side rotational movement, with said transverse leaf spring adjusted to a preferred ride character.

4. The modular suspension system, as disclosed in Claim 1, wherein said trailing arm assembly further comprises:

a lower lift cylinder mount of said at least one lift cylinder at a lift cylinder mounting attachment positioned in front of said rear axle, said lift cylinder having an upper lift cylinder mount which is
5 pivotally mounted to a lift cylinder mounting attachment in said lift arm assembly in front of said fifth wheel plate, said lift cylinder, when activated, extending, raising said rear segment of said lift arm assembly and said fifth wheel plate, transferring relative lifting forces to said lift arm assembly and trailing arm assembly, isolating said relative lifting forces from said frame of said terminal tractor
10 by said composite bushings, said elastomeric trailing arm bushings and a spring means at said rear segment of said trailing arm assembly.

5. The modular suspension system, as disclosed in Claim 1, wherein said trailing arm assembly further comprises:

two lower lift cylinder mounts of two lift cylinders at two lift cylinder mounting attachments positioned in front of said rear axle, each said lift cylinder having an upper lift cylinder mount which

5 is pivotally mounted to two lift cylinder mounting attachments in said lift arm assembly in front of said fifth wheel plate, said lift cylinders, when activated, extending, raising said rear segment of said lift arm assembly and said fifth wheel plate, transferring relative lifting forces to said lift arm assembly and trailing arm assembly, isolating said relative lifting forces from said frame of said terminal tractor by said composite bushings, said elastomeric trailing arm bushings and a spring

10 means at said rear segment of said trailing arm assembly.

6. The modular suspension system, as disclosed in Claim 1, wherein said lift arm assembly further comprises:

at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, said rear ends each including a fifth wheel plate mounting bracket between
5 which is attached said fifth wheel plate by pivot pins, each said rear end also including a lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to an upper lift cylinder mount of at least one lift cylinder, each said front end further including a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a lower endcap
10 mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate.

7. The modular suspension system, as disclosed in Claim 1, wherein said trailing arm assembly further comprises:

two trailing arm beams having a front end and a rear end, each said front end having a lower control arm droplink welded to each said trailing arm beam, said trailing arm beams joined at said front ends

5 by a front suspension cross member and reenforced by a corner brace, each said control arm droplink defining a pivot bushing socket tube containing said elastomeric trailing arm bushings, with a suspension attaching bolt attaching each elastomeric trailing arm bushing and each composite bushing

through said pivot bushing socket tube to suspension attaching bolt tubes of said terminal tractor frame, and each said rear end of said trailing arm beam welded to an axle clamp mounting plate and

10 a trailing arm weldment comprising a rear portion of each trailing arm;

an axle clamp weldment secured to an axle clamp mounting plate by lower clamp bolts, said axle clamp weldment further attached to said rear portion of said trailing arm assembly by end housing retainer bolts and rear cross member retainer bolts, wherein said axle clamp mounting plate, rear axle clamp weldment and said trailing arm weldment define a cavity within which said rear axle is secured

15 to said trailing arm assembly and clamped in place by axle clamp bolts;

a rear cross member and fifth wheel rest weldment secured upon an upper surface of each trailing arm weldment with spring end housings securing a spring means;

a cylinder mounting attachment welded to a lower surface of each trailing arm beam supporting a lower lift cylinder mount of at least one lift cylinder and a suspension center cross member connecting said two trailing arm beams and supporting said lower lift cylinder mounting attachment;

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two end housings within which are secured ends of said spring means attached to said trailing arm

weldment by upper clamp bolts said ends of said spring means secured within said end housings by rubber spring end isolators.

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8. The modular suspension system, as disclosed in Claim 1, further comprising:

a rear loading ramp integrated within said terminal tractor frame adapted to said modular suspension system, said rear loading ramp defining a tapered approach section having a suspension mounting cross member to facilitate mounting of a spring means, a recess within said tapered approach section
5 defining a rear cross member plate leading to an approach extension, directed to said fifth wheel plate when said lift arm assembly is in a lowered position.

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9. A modular suspension system adapted to a terminal tractor having a frame, comprises:

a lift arm assembly having a rear segment and a front segment pivotally attached to a fifth wheel plate;

a trailing arm assembly having a front segment and a rear segment attaching to a rear axle, said front segment pivotally connecting to said frame of said terminal tractor at two pivot bushing socket tubes

5 housing elastomeric trailing arm pivot bushings which rotate on a common axis, said elastomeric trailing arm bushings holding an enforced longitudinal position of said trailing arm assembly while allowing limited vertical movement and side-to-side rotation of said trailing arm assembly relative

to said frame, wherein said front segment of said hydraulic lift arm assembly is joined to said trailing arm assembly by two large diameter composite bushings rotating on said outer surface of said pivot
10 bushing socket of said elastomeric trailing arm pivot bushings, said elastomeric trailing arm pivot bushings isolating said trailing arm assembly and said lift arm assembly from said frame, with at least one lift cylinder forcing said lift arm assembly from said trailing arm assembly to forcibly elevate and lower said lift arm assembly and said fifth wheel plate;

said trailing arm portion further comprising a rear portion supporting two end housings behind said
15 rear axle securing two ends of a spring means, said spring means having a center, said spring means further stabilizing side to side location of said rear axle and said lift arm assembly and providing controlled vertical and side to side rotational movement, with said spring means adjusted to a preferred ride character; and

a lower lift cylinder mount of said at least one lift cylinder at a lift cylinder mounting attachment
20 positioned in front of said rear axle, said at least one lift cylinder having an upper lift cylinder mount which is pivotally mounted to a lift cylinder mounting attachment in said lift arm assembly in front of said fifth wheel plate, said lift cylinder, when activated, extending, raising said rear segment of said

lift arm assembly and said fifth wheel plate, transferring relative lifting forces to said lift arm assembly and trailing arm assembly, isolating said relative lifting forces from said frame of said terminal tractor by said composite bushings, said elastomeric trailing arm bushings and said spring means at said rear segment of said trailing arm assembly.

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10. The modular suspension system, as disclosed in Claim 9, wherein said lift arm assembly further comprises:

at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, said rear ends each including a fifth wheel plate mounting bracket between

5 which is attached said fifth wheel plate by pivot pins, each said rear end also including said lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to said upper lift cylinder mount of said at least one lift cylinder, each said front end further including

a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a

10 lower endcap mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate.

11. The modular suspension system, as disclosed in Claim 9, wherein:

said lift arm assembly further comprises at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, each said rear end including a fifth wheel plate mounting brackets between which is attached said fifth wheel plate by pivot pins, each said rear end also including said lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to said upper lift cylinder mount of said at least one lift cylinder, each said front end further including a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a lower endcap mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate; and

said trailing arm assembly further comprises two trailing arm beams having a front end and a rear end, each said front end having a lower control arm droplink welded to each said trailing arm beam, said trailing arm beams joined at said front ends by a front suspension cross member and reenforced by a corner brace, each said control arm droplink defining a pivot bushing socket tube containing said elastomeric trailing arm bushings, with a suspension attaching bolt attaching each elastomeric trailing arm bushing and each composite bushing through said pivot bushing socket tube to suspension attaching bolt tubes of said terminal tractor frame, and each said rear end of said trailing arm beam welded to an axle clamp mounting plate and a trailing arm weldment comprising a rear portion of each trailing arm;

an axle clamp weldment secured to an axle clamp mounting plate by lower clamp bolts, said axle clamp weldment further attached to said rear portion of said trailing arm assembly by end housing

retainer bolts and rear cross member retainer bolts, wherein said axle clamp mounting plate, rear axle clamp weldment and said trailing arm weldment define a cavity within which said rear axle is secured to said trailing arm assembly and clamped in place by axle clamp bolts;

a rear cross member and fifth wheel rest weldment secured upon an upper surface of each trailing arm weldment with said spring end housings securing said spring means;

a cylinder mounting attachment welded to a lower surface of each trailing arm beam supporting said lower lift cylinder mount of said at least one lift cylinder and a suspension center cross member connecting said two trailing arm beams and supporting said lower lift cylinder mounting attachment; and

said two end housings attached to said trailing arm weldment by upper clamp bolts, said ends of said spring means secured within said end housings by rubber spring end isolators.

12. The modular suspension system, as disclosed in Claim 9, wherein:

said lift arm assembly further comprises at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, each said rear end including a fifth wheel plate mounting brackets between which is attached said fifth wheel plate by pivot pins, each said rear end also including said lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to said upper lift cylinder mount of said at least one lift cylinder, each said front end further including a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a lower endcap mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate;

said trailing arm assembly further comprises two trailing arm beams having a front end and a rear end, each said front end having a lower control arm droplink welded to each said trailing arm beam, said trailing arm beams joined at said front ends by a front suspension cross member and reenforced by a corner brace, each said control arm droplink defining a pivot bushing socket tube containing said elastomeric trailing arm bushings, with a suspension attaching bolt attaching each elastomeric trailing arm bushing and each composite bushing through said pivot bushing socket tube to suspension attaching bolt tubes of said terminal tractor frame, and each said rear end of said trailing arm beam welded to an axle clamp mounting plate and a trailing arm weldment comprising a rear portion of each trailing arm;

an axle clamp weldment secured to an axle clamp mounting plate by lower clamp bolts, said axle clamp weldment further attached to said rear portion of said trailing arm assembly by end housing

retainer bolts and rear cross member retainer bolts, wherein said axle clamp mounting plate, rear axle clamp weldment and said trailing arm weldment define a cavity within which said rear axle is secured to said trailing arm assembly and clamped in place by axle clamp bolts;

a rear cross member and fifth wheel rest weldment secured upon an upper surface of each trailing arm weldment with spring end housings securing said spring means;

a cylinder mounting attachment welded to a lower surface of each trailing arm beam supporting said lower lift cylinder mount of said at least one lift cylinder and a suspension center cross member connecting said two trailing arm beams and supporting said lower lift cylinder mounting attachment;

said two end housings attached to said trailing arm weldment by upper clamp bolts, said ends of said spring means secured within said end housings by rubber spring end isolators; and

a rear loading ramp integrated within said terminal tractor frame adapted to said modular suspension system, said rear loading ramp defining a tapered approach section having a suspension mounting cross member to facilitate mounting of said spring means, a recess within said tapered approach section defining a rear cross member plate leading to an approach extension, directed to said fifth

wheel plate when said lift arm assembly is in a lowered position.

13. A modular suspension system adapted to a terminal tractor having a frame, comprises:

a lift arm assembly having a rear segment and a front segment pivotally attached to a fifth wheel plate;

a trailing arm assembly having a front segment and a rear segment attaching to a rear axle, said front segment pivotally connecting to said frame of said terminal tractor at two pivot bushing socket tubes

5 housing elastomeric trailing arm pivot bushings which rotate on a common axis, said elastomeric trailing arm bushings holding an enforced longitudinal position of said trailing arm assembly while allowing limited vertical movement and side-to-side rotation of said trailing arm assembly relative

to said frame, wherein said front segment of said hydraulic lift arm assembly is joined to said trailing arm assembly by two large diameter composite bushings rotating on said outer surface of said pivot

10 bushing socket of said elastomeric trailing arm pivot bushings, said elastomeric trailing arm pivot bushings isolating said trailing arm assembly and said lift arm assembly from said frame, with two tandem lift cylinders forcing said lift arm assembly from said trailing arm assembly to forcibly elevate and lower said lift arm assembly and said fifth wheel plate;

said trailing arm portion further comprising a rear portion supporting two end housings behind said

15 rear axle securing two ends of a transverse leaf spring, said transverse leaf spring having a center, said transverse leaf spring further stabilizing side to side location of said rear axle and said lift arm assembly and providing controlled vertical and side to side rotational movement, with said transverse leaf spring adjusted to a preferred ride character; and

lower lift cylinder mounts of said two lift cylinders at lift cylinder mounting attachments positioned

20 in front of said rear axle, said lift cylinders having upper lift cylinder mounts which are pivotally mounted to lift cylinder mounting attachments in said lift arm assembly in front of said fifth wheel plate, said lift cylinders, under pressure, extending, raising said rear segment of said lift arm assembly

and said fifth wheel plate, transferring relative lifting forces to said lift arm assembly and trailing arm assembly, isolating said relative lifting forces from said frame of said terminal tractor by said composite bushings, said elastomeric trailing arm bushings and said transverse leaf spring at said rear segment of said trailing arm assembly.

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14. The modular suspension system, as disclosed in Claim 13, wherein said lift arm assembly further comprises:

said lift arm assembly further comprises at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, each said rear end including a fifth wheel plate mounting brackets between which is attached said fifth wheel plate by pivot pins, each said rear end also including said lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to said upper lift cylinder mount of said at least one lift cylinder, each said front end further including a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a lower endcap mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate.

15. The modular suspension system, as disclosed in Claim 13, wherein:

said lift arm assembly further comprises at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, each said rear end including a fifth wheel plate mounting brackets between which is attached said fifth wheel plate by pivot pins, each said rear end also including said lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to said upper lift cylinder mount of said at least one lift cylinder, each said front end further including a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a lower endcap mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate; and

said trailing arm assembly further comprises two trailing arm beams having a front end and a rear end, each said front end having a lower control arm droplink welded to each said trailing arm beam, said trailing arm beams joined at said front ends by a front suspension cross member and reenforced by a corner brace, each said control arm droplink defining a pivot bushing socket tube containing said elastomeric trailing arm bushings, with a suspension attaching bolt attaching each elastomeric trailing arm bushing and each composite bushing through said pivot bushing socket tube to suspension attaching bolt tubes of said terminal tractor frame, and each said rear end of said trailing arm beam welded to an axle clamp mounting plate and a trailing arm weldment comprising a rear portion of each trailing arm;

an axle clamp weldment secured to an axle clamp mounting plate by lower clamp bolts, said axle clamp weldment further attached to said rear portion of said trailing arm assembly by end housing

retainer bolts and rear cross member retainer bolts, wherein said axle clamp mounting plate, rear axle clamp weldment and said trailing arm weldment define a cavity within which said rear axle is secured to said trailing arm assembly and clamped in place by axle clamp bolts;

a rear cross member and fifth wheel rest weldment secured upon an upper surface of each trailing arm weldment with said spring end housings securing said transverse leaf spring;

a cylinder mounting attachment welded to a lower surface of each trailing arm beam supporting said lower lift cylinder mounts of said lift cylinders and a suspension center cross member connecting said two trailing arm beams and supporting said lower lift cylinder mounting attachments; and

said two end housings attached to said trailing arm weldment by upper clamp bolts, said ends of said transverse leaf spring secured within said end housings by rubber spring end isolators.

16. The modular suspension system, as disclosed in Claim 13, wherein:

said lift arm assembly further comprises at least two longitudinal rails connected by at least two lateral rails, each longitudinal rail having a front end and a rear end, each said rear end including a fifth wheel plate mounting brackets between which is attached said fifth wheel plate by pivot pins, each said rear end also including said lift cylinder mounting attachment located in front of said fifth wheel plate mounting bracket, attaching to said upper lift cylinder mount of said at least one lift cylinder, each said front end further including a pivot bushing housing containing a lower mounting block and an upper mounting block which respectively attach together with endcap retaining bolts to an upper endcap mounting block and a lower endcap mounting block of an endcap, within which one of said composite pivot bushings are secured, said lift arm assembly further stiffened and held in desired relation by a welded top plate;

said trailing arm assembly further comprises two trailing arm beams having a front end and a rear end, each said front end having a lower control arm droplink welded to each said trailing arm beam, said trailing arm beams joined at said front ends by a front suspension cross member and reenforced by a corner brace, each said control arm droplink defining a pivot bushing socket tube containing said elastomeric trailing arm bushings, with a suspension attaching bolt attaching each elastomeric trailing arm bushing and each composite bushing through said pivot bushing socket tube to suspension attaching bolt tubes of said terminal tractor frame, and each said rear end of said trailing arm beam welded to an axle clamp mounting plate and a trailing arm weldment comprising a rear portion of each trailing arm;

an axle clamp weldment secured to an axle clamp mounting plate by lower clamp bolts, said axle clamp weldment further attached to said rear portion of said trailing arm assembly by end housing

retainer bolts and rear cross member retainer bolts, wherein said axle clamp mounting plate, rear axle clamp weldment and said trailing arm weldment define a cavity within which said rear axle is secured to said trailing arm assembly and clamped in place by axle clamp bolts;

a rear cross member and fifth wheel rest weldment secured upon an upper surface of each trailing arm weldment with said spring end housings securing said transverse leaf spring, said two end housings attached to said trailing arm weldment by upper clamp bolts, said ends of said transverse leaf spring secured within said end housings by rubber spring end isolators;

a cylinder mounting attachment welded to a lower surface of each trailing arm beam supporting said lower lift cylinder mounts of said lift cylinders and a suspension center cross member connecting said two trailing arm beams and supporting said lower lift cylinder mounting attachments; and

a rear loading ramp integrated within said terminal tractor frame adapted to said modular suspension system, said rear loading ramp defining a tapered approach section having a suspension mounting cross member to facilitate mounting of said spring means, a recess within said tapered approach section defining a rear cross member plate leading to an approach extension, directed to said fifth wheel plate when said lift arm assembly is in a lowered position.